FOR MYSORE STATE

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[Despatch Abstract.]

Agriculture - I. C. A. R. Research Scheme for manufacturing gas out- fit - Sanctioned - Communicated to A. A., for D.A. and D.S.

No.F.12 (10)/100/14.
INDIAN AGRICULTURE RESEARCH INSTITUTE.
New Delhi, the 4--1--50.

From
Dr. J.M. Mukerjee, FNI, FRASB, FCS,
Director.

To
The Secretary to the Government of Madras,
Department of Agriculture,
M a d r a s.

Sir,

As desired by the Government of India Ministry of Agriculture a note embodying particulars about a Gas Plant for manufacturing gas out of cowdung, evolved at this Institute, is forwarded herewith for ~~x~~ information.

Yours faithfully,

xxx xxx x

Director.

(TRUE COPY)

V.N.M.
30/5/

Compared by.
K.C. Shankar 1.6.53
+
K.V. Ambujakshan 1.6.53

PRODUCTION OF FUEL GAS FROM COWDUNG.

The Indian Agricultural Research Institute undertook a study of the process of preparing fuel gas from cowdung organic and wastes on laboratory scale in 1939.

2. At first the experiment was started in suitable bottles with straw leaf powder with a small quantity of ammonium suphate to supply the nitrogen requirement of the organisms. The necessary organisms were supplied from lake mud sewage material and rotten farm yard manure. In about a month and a half ferementation commenced but the gas evolved was mostly carbon di oxide and did not burn but afterwards a combustible gas generated and burnt with a non-luminous flame. The results of these were presented at the 10th Annual meeting of the Nationnal Academy of Science (India) held in February 1941.

3. When a preliminary experiment as stated above proved successful the problem was given a trial on a large scale. A fuel gas plant was installed in September 1941 and cowdung was added for fermentation. The gas produced at first did not burn but after about a week the evolved gas burnt. The findings were recorded and published in the form of an article entitled 'Manure and Gas Production by anaerobic fermentation of organic wastes' (Indian Farming Vol VI. February '45 p.67) and a note 'Fuel gas' was published in the same journal in its March 1945 issue.

4. Prof. N.V. Joshi, was was Assistant Agricultural Bacteriologist at this Institute till April 1940 took keen interest in the development of the process after retirement from the service of this Institute, gave an address on the dudl use of cowdung at the annual meeting of the Indian Science Congress at Nagpur in 1945. It is understood th he prepared fermentation tank and gas holder out of empt:

barrels at the Poona Law College in 1945, and installed a family size plant at Poona in 1946 which is stated to e be very similar to the one erected at the Division of Soil Science and Agricultural Chemistry in 1941. Dr. S.V. Desai who developed this process at this Institute visited the plant on 10--1--1946 and suggested certain improvements. It was sometime afterwards that the Walchandnagar Industries erected a big plant to deal with 4000-5000 lbs of cowdung per day at the instance of Prof. Joshi at Walchandnagar (Poona District). In July 1946 another article from the I.A.R.I appeared in the special village development number of the Indian Farming where suggestions have been given for a plant to deal with larger quantities of cowdung.

5. Sometime in 1947 Prof. Joshi took out a petent on fuel gas plant which he says is of such an improved pattern that the patent office has been pleased to grant him the patent asked for. Prof. Joshi as asked acknowledged that the priority of the ingention belongs to this Institute. An article is understood to have been published in a Marathi Journal which is practically a translation of the article in Indian Farming of 1945.

6. To study economics and any disadvantages in the working of a bigger plant the I.A.R.I is going to instal another plant 8 times the size of the present one to deal with about 80 lbs. of cowdung per day. This plant when erected is expected to supply fuel gas sufficient for an average Indian family of 5 members and data for calculation of economics of the process.

7. So far the Nitrogen content of the material under fermentation has been conserved without any loss. The output of gas varied with climatic changes between 2-10 cft per lbs of fresh cowdung. The fermented material proved in no way inferior to ordinary farm yard manure.

Description of the plant and need for further experiments.

Existing plant at the I.A.R.I.

The fuel gas plant mentioned in para 3 above was installed in 1941 in the Division of Soil Science and Agricultural Chemistry at this Institute at a cost of Rs.250/- The Plant consists of fermentation tank, a gas holder, and a pipe with a stop cock to deliver the gas to a burner. Its cost at present market rates will not be less than Rs.800/-

The fermentation tank has a m dimension, 30" diameter, 48" height, with a capacity of 30 cu.ft. A fortnightly charge of 150 lbs. of cow dung with equal quantity of water is introduced at a time. It produces 2 cu.ft. of gas per day in the winter and 10 cu. ft. in summer. During the rest of the season the daily production lies in between. A photograph of the plant is attached.

Suitability of the plant at the Institute for use of families in rural areas and families in cities who possess cattle.

One of the great defects of the process is the difference in the output of gas in different times of the year. In southern India, where the difference between the summer and winter temperature is not much, this difference between the output of gas in summer and winter will be less. Another difficulty is that the existing plant requires a fortnighly charge of 150lbs. An average family in rural areas may be assumed to consist of 7 members and to possess 4 heads of cattle. Dung production of 4 heads of cattle on an average may be takne to be 50 lbs. a day.

Assuming ideal conditions this charge of 150 lbs. in the existing plant will produce 10 cu.ft. of gas per day. The calorific value of a cubic foot of this gas is probably about 600 British thermal units (B.T.U.) and the calorific value of low grade coal consumed as fuel in homes is about 9,000 B.T.U. per lb. Ten cubic feet of gas are, therefore, equivalent to 2/3 of a lb. of

coal, that is, the total output of the gas during a month will have a fuel value equivalent to 20 lbs. of coal. The consumption of coal per month for an average family of 7 will be about 3 maunds. The present plant is, therefore, absolutely inadequate for meeting the needs of a family.

Another point which requires serious consideration is the fire hazard. There is risk of explosion and also of fire in rural homes unless adequate precaution is taken which means a certain amount of education in the use of gas tank and gas fire. Besides, if any leaks spring in the gas holder or in the fermentation tank welding will be necessary and the pipe may require cleaning at intervals. Facilities for these should, therefore, be made available if these plants are to work successfully in rural areas.

To provide for an output of gas equivalent to 3 m maunds of coal, a plant having twelve times the capacity of the existing plant will have to be fabricated. It will, thus, require (12 x 150) 1800 lbs. of dung every fortnight. The dung of 4 heads of cattle will thus have to be collected for 36 days before a charge can be made. Obviously, since a fortnightly charge is made, dung collected for 15 days is the maximum which can be used at one charge and will be utterly inadequate for a plant of this size. Apart from this if dung is allowed to remain for 15 days there will be fermentation and loss of moisture which may lower the output of the gas during the first few days after the charge has been made.

For reasons given above the use of the existing plant in rural areas has not been recommended.

Larger size plant at Valchandnagar.

A larger scale plant as mentioned in para 4 above was set up at Walchandnagar (District Poona) by the Walchandnagar Industries Ltd., Bombay which was set up at the instance of Mr. N.V. Joshi. It cost Rs.18,119/9/-

It was set up during the last war. Its daily requirement of cow dung is 4,000 to 5,000 lbs. and it s output in cubic foot, that is, half of that given above for ideal conditions. The plant could however not be worked to its full capacity as the firm did not get materials to construct gas holders. The opinion of the firm is given below:-

'After the digestion of the dung, the sludge which is in the semi-liquid form, has to be spread over on the filter beds to take out the excess moisute. If it is used in the manure pits in the original state, it hinders the decomposition of manure and good manure is not prepared. However, with the experience we have had in this respect we feel that in rural areas where composting and disposal of cow dung does not offer a problem or involve much cost, it is not an economical proposition to instal a gas generator. We are of opinion that its maintenance cost works out higher than the cost of fuel produced. The plant may be useful in urban areas and big cities where the disposal of the dung is a great problem and an expensive affair'.

A complete plant similar to the above will not cost not less than Rs.30,000 and may be more.

NEED FOR FURTHER EXPERIMENTS.

The process is undoubtedly of great interest for the manurial value of the dung is fully preserved and a fuel gas is obtained at the same time. It is however, essentially a question of economics. In view of the great interest that the public are taking and the calims made by Mr. Joshi, it is most desirable that the economics of the plant are worked under conditions which are more suitable for its use. If set up in

set up in a place where the cost of collection of cow dung will be minimum and the size of the plant is large enough the cost of production is likely to be less than it would be otherwise. If the gas could be fully utilised from the dung obtainable in ~~a~~dairy, which can simultaneously utilize the manurial value of the residue for producing fodder for cattle, these conditions will be most favourable. ~~The best use of the gas will be for~~ ~~for the most~~ ~~.~~ The best use of the gas will be for

(a) sterilization of vessels;

(b) pasteurization of milk; and

(c), consumption for ~~c~~cooking by the people employed at the dairy. Whether the whole output of the gas could be thus utilized is a matter which depends on the size of the plant and the quantity of gas which can be used.

Major D.T. Brown, Agricultural Engineer of the Institute has prepared plans and estimates of a plant having an output eight times more than the present demonstration plant at the Institute. This scale has been decided upon in order to avoid risks of the failure economically of a costly large scale plant and at the same time to afford necessary data for working out approximately the economics of gas production on a suitably large scale by this process.

Sd. J.N. Mukerjee,
Director.
Indian Agricultural Research
Institute, New Delhi.

V.N.M.
30/5/

(TRUE COPY)

Compared by.
J.C. Shamkar 7.6.53
&
K.V. Ambujakshan 7.6.53

GOVERNMENT OF MADRAS.
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AGRICULTURE - I.C.A.R. Research - Gas Plant for manufacturing gas out of cow dung Note communicated to the D.A. and Director of Industries and Ag Commerce.

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FOOD & AGRICULTURE.(K)

TO A.S.

Please see the letter from the I.C.A.R. at p.1 c.f. and the note at pp.3-11 cf. embodying particulars about a gas plant for manufacturing gas out of cowdung carried out at the Indian Agricultural Research Institute, New Delhi, The not is of general interest. A copy each of pp1-11 cf. may be sent to the Director of Agriculture and Director of Industries and commerce for information and the pages may be recorded. The draft order on p.1. above is for approval.

This may be sent to Development for perusal before issue

Dev. (F. & II)

May be perused and returned to Food and Agriculture.

-Dev. U.O. 6621 d/28-1-50

Food & Agri.

To A.S. Development note at bottom of previous page. The draft order on p. 1 above may now issue.

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(Issued as G.O. Ms. No. 231 d/7--2--50)

(TRUE COPY)

SUPERINTENDENT.

V.N.M.

30/5/

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